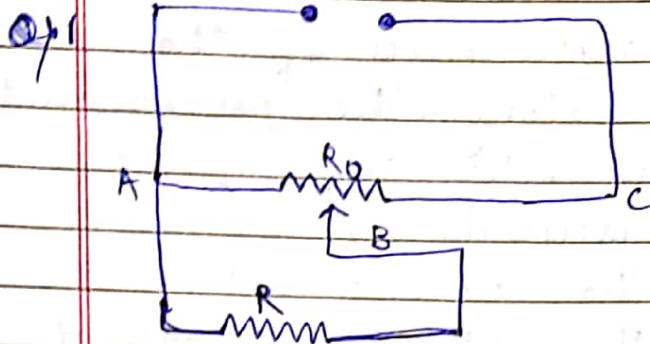


H.W

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HOME ASSIGNMENT  
POTENTIOMETER



When the sliding contact is in middle, a resistance  $R_0/2$  is connected in series with a parallel combination of  $R$  and  $R_0/2$ . Hence, net resistance is given by

$$R_{eq} = \frac{R_0}{2} + \frac{R_0}{2} \parallel R$$

Current flowing through the circuit is given by

$$I = \frac{V}{R_{eq}}$$

Potential across  $R$  is given by

$$V_R = I \left( \frac{R_0}{2} \parallel R \right)$$

$$V_R = \frac{V}{R_{eq}} \left( \frac{R_0}{2} \parallel R \right)$$

Solving  $V_R = \frac{R}{4R + R_0} V$

Q/2 By increasing  $R$ , the current through  $AB$  decreases. So potential gradient decrease.

Hence a greater length of wire would be needed for balancing the same potential

difference. So the null point would shift towards B.

ii) By decreasing resistance  $S$ , the current through  $AB$  remains same.

Potential gradient does not change. As  $K_2$  is open so there is no effect of  $S$  on null point.

Q.3) ~~at~~ The potential drop across the length of a steady current carrying wire of uniform cross section is proportional to the length of wire.

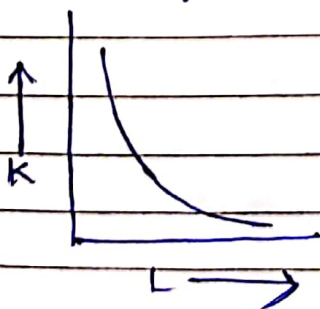
∴ We use a long wire to have a lower value of potential gradient i.e. a lower least count or greater sensitivity of the potentiometer.

ii) The area of cross section has to be uniform to get a uniform wire as per the principle of the potentiometer.

iii) The emf of the driving cell has to be greater than the emf of the primary cells as otherwise no balance point would be obtained.

b) Potential gradient  $K = \frac{V}{L}$

The required graph is also shown



4) a) The purpose of using high resistance  $R_2$  is to reduce the current through the galvanometer. When Jockey is far from balance point, this saves the galvanometer and the cell (emf  $\mathcal{E}$ ) from being damaged.

b) When resistance  $R_1$  is decreased, the potential gradient of potentiometer wire increases, so balance point (J) shifts to longer length of wire.

c) 1) The balance point is not obtained because maximum emf across potentiometer wire is  $2V$ .

2) When key (K) is closed, the terminal potential difference of cell is zero; so balance point cannot be between A and B.

5) i) Decreases (The potential gradient would increase)

ii) Increases (The terminal p.d. across the cell would increase).

— X —